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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/783,940	02/20/2004	Ju-Jin An	8054-26 (AW8120US/JY)	4785

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F. CHAU & ASSOCIATES, LLC  
130 WOODBURY ROAD  
WOODBURY, NY 11797

EXAMINER
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DEO, DUY VU NGUYEN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 10/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/783,940

Applicant(s)

AN ET AL.

Examiner

Duy-Vu N. Deo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3, 5, 7-13, 15 and 17-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5, 7-13, 15, 17-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3, 5, 7-9, 15, 17, 24-26, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art, Iyer et al. (US 6,383, 723), and Schulz (US 5,637,151).

Admitted prior art describes a method for etching a conductive film, such as polysilicon, metal, and metal compounds, comprising: forming an insulating oxide layer on a substrate, forming a conductive film on the insulating oxide layer, forming an ARC film, such as silicon oxide, nitride, and silicon oxynitride (this would form oxide residues), on the conductive film, forming a photoresist pattern on the ARC film, patterning the conductive film using the photoresist pattern (specification, pages 1-3). Unlike claimed invention, admitted prior art doesn't suggest cleaning the ARC film using a first and second cleaning solutions. Iyer describes a method for etching substrate wherein he teaches cleaning the ARC film, including silicon oxide, nitride, and oxynitride, by a first sulfuric acid solution and a second DI water (claimed second solution) (col. 3, line 10-20, line 30-col. 4, line 8) before applying the photoresist on the ARC film. It would have been obvious for one skilled in the art at the time of the invention to modify admitted prior art in light of Iyer's teaching of cleaning the ARC film

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because he teaches that by cleaning the ARC film before forming the photoresist would reduce the defects such as resist footing and T-topping (ab.; col. 3, line 55-65). These cleaning solutions would clean any oxide residues on the ARC film.

Applied prior art above doesn't suggest the second cleaning solution includes SC-1. Schulz describes a method for cleaning substrate including a sulfuric cleaning solution and a SC-1 cleaning solution afterward (figs 1 and 2). It would have been obvious for one skilled in the art at the time of the invention to modify applied prior art in light of Schulz's teaching of using SC-1 because it would improve remove particles from the surface of the wafers (col. 1, line 44-49; col. 2, line 1-5; ab.).

Referring to claims 2 and 25, admitted prior art describes the oxide residues are generated from a purge gas containing nitrogen oxide (page 3 of the specification).

Referring to claims 5 and 15, Iyer describes the first sulfuric cleaning is done at T 70-150 degree Celsius and for about 5-50 mins (col. 4, line 9-17).

Referring to claims 7, 17, and 26, even though Iyer doesn't describe the second cleaning step, DI water rinsing, is performed at a T 30-70 degrees Celsius for about 5-15 mins; however, one skilled in the art would find it obvious to determine the T and time of the DI water rinsing through routine experimentation given the facts that Iyer teaches ranges for the T and time in the first cleaning of using the sulfuric acid.

Referring to claim 8, even though applied prior art doesn't describe the first and second cleaning process are done in-situ; however, this is a cleaning process, one skilled in the art would find it obvious to do these cleanings in-situ because it would

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eliminate the transferring step, if not done in-situ, which can cause airborne contamination of the substrate during the transferring step.

Referring to claim 24, the steps for forming a volatile memory cell, including forming a transistor and a pad, forming a contact hole through an insulating layer and an ARC layer to the pad and forming a contact plug in the contact hole are known to one skilled in the art (please see page 2 of the specification and Nesbit et al. (US 6,686,668) cited below).

3. Claims 18, 22, 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang et al. (US 6,159,860), Iyer et al. (US 6,383, 723), and Schulz (US 5,637,151).

Yang describes a method for forming a semiconductor memory gate comprising: forming a tunnel oxide 15 on a substrate, forming a first conductive poly 1 on the tunnel oxide film; forming a ONO film on the poly 1; forming a second poly 2 on the ONO film; forming a WSix on the second poly 2; forming a SiON (claimed hardmask and this would also form oxide residues) on the WSix; forming a photoresist pattern on the hardmask; patterning the hardmask using the photoresist and patterning the WSix, the second poly 2, the ONO and the first conductive poly 1 using the hardmask (fig. 4; col. 4, line 40-col. 5). Unlike claimed invention, Yang doesn't suggest cleaning the ARC film using a first and second cleaning solutions. Iyer describes a method for etching substrate wherein he teaches cleaning the ARC film, including silicon oxide, nitride, and oxynitride, by a first sulfuric acid solution and a second DI water (claimed second solution) (col. 3, line 10-20, line 30-col. 4, line 8) before applying the photoresist on the

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ARC film. It would have been obvious for one skilled in the art at the time of the invention to modify Yang in light of Iyer's teaching of cleaning the ARC film because he teaches that by cleaning the ARC film before forming the photoresist would reduce the defects such as resist footing and T-topping (ab.; col. 3, line 55-65). These cleaning solutions would clean any oxide residues on the ARC film.

Applied prior art above doesn't suggest the second cleaning solution includes SC-1. Schulz describes a method for cleaning substrate including a sulfuric cleaning solution and a SC-1 cleaning solution afterward (figs 1 and 2). It would have been obvious for one skilled in the art at the time of the invention to modify applied prior art in light of Schulz's teaching of using SC-1 because it would improve remove particles from the surface of the wafers (col. 1, line 44-49; col. 2, line 1-5; ab.).

Referring to claim 22, Iyer describes the first sulfuric cleaning is done at T 70-150 degree Celsius and for about 5-50 mins (col. 4, line 9-17).

Referring to claim 23, even though Iyer doesn't describe the second cleaning step, DI water rinsing, is performed at a T 30-70 degrees Celsius for about 5-15 mins; however, one skilled in the art would find it obvious to determine the T and time of the DI water rinsing through routine experimentation given the facts that Iyer teaches ranges for the T and time in the first cleaning of using the sulfuric acid.

5. Claims 10-13, 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art/Iyer/Schulz or Yang/Iyer/Schulz as applied to claims 9 and 18 above, and further in view of Okoroanyanwu et al. (US 6,753,247).

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Applied prior art above doesn't describe the ARC film comprises a 1st ARC, an oxide film on the 1st ARC, and a 2<sup>nd</sup> ARC on the oxide. Okoroanyanwu describes a method for forming a memory cell using an ARC film that can have one or more layers of oxide, nitride, and oxynitride (col. 9, line 25-55). One skilled in the art would find it obvious at the time of the invention to use a multi-ARC film in light of Okoroanyanwu's teaching because he teaches that- one or more films can be used depending on the desired optical antireflective properties (col. 9, line 35-38).

Referring to claims 13 and 20, Okoroanyanwu further teaches that the ARC layer can be formed to any suitable thickness to facilitate achieving desired objectives and performance criteria (col. 9, line 50-55). Therefore, one skilled in the art would find it obvious to determine the thickness of the ARC materials through routine experimentation in order to provide an optimum thickness for the ARC layer.

4. Nesbit et al. is cited to show prior art (figs. 7-11).

***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 1-3, 5, 7-13, 15, 17-27 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to

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reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Applicant has not shown where in the specification teaching of the limitation "...oxide residues generated in forming the anti-reflective layer..." and "...oxide residues generated in forming the hardmask layer..."

### ***Response to Arguments***

7. Applicant's arguments filed 2/14/06 have been fully considered but they are not persuasive.

In response to applicant's argument that Iyer does not render cleaning oxide residues on an anti-reflective layer using a first solution, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Exparte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). Applicant has not provide facts to show that Iyer's first and cleaning solution would not remove oxide residues from the anti- reflective layer. Iyer teaches using sulfuric acid that is the same as of claimed invention. Therefore, his solution would also remove any oxide residues on the anti-reflective layer.

Applicant's arguments that APA does not disclose the cleaning steps and Iyer do not disclose the second cleaning using SC-1 at 30-70 degrees C. for 5-15 min are acknowledged. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually



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where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Referring to applicant's argument that it is not obvious to determine the T and time through routine experimentation since Iyer doesn't disclose any optimum or workable ranges of T and time is found unpersuasive because given the fact that Iyer teaches ranges for the T, 70-150 degrees C., and time, 5-50 mins, in the first cleaning of using the sulfuric acid, one skilled in the art would find it obvious to recognize that these two processing parameters are result effective variable for any solution being used; therefore, they must be determined through routine experimentation to provide the optimum T, and time.

Applicant has not traverse and address the motivations for combining Iyer's cleaning steps and the motivation for combining of Schulz as cited above.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Duy-Vu N. Deo whose telephone number is 571-272-1462. The examiner can normally be reached on Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Duy-Vu N Deo  
Primary Examiner  
Art Unit 1765

10/16/06

